

**CLAIMS**

1. An umbrella comprising:  
a shaft,  
5 a plurality of rib members, first ends of said rib members spaced about and pivotally connected at or adjacent a first end of said shaft,  
a canopy including pocket means at or adjacent to the periphery of the canopy wherein an opening or openings in the pocket means is accessible from the direction of the central portion of the canopy,  
10 a sliding means movable along the shaft to erect or collapse the umbrella,  
a plurality of struts, each of which is pivotally connected between the sliding means and a rib member, and  
force spreading means provided on a second end of each rib member, the force spreading means received within the pocket means of the canopy.
- 15 2. An umbrella as claimed in claim 1, wherein the inside of the or each pocket means, at least opposite to the opening, is closed to provide a bearing surface upon which the force spreading means contacts.
3. An umbrella as claimed in claim 1 or claim 2, wherein said pocket means comprise a plurality of separate pockets spaced about the canopy's periphery, wherein  
20 one force spreading means is received within each pocket.
4. An umbrella as claimed in claim 3, wherein a closed edge of each pocket lies along the periphery of the canopy and the opening in each pocket is in the form of a slit substantially aligned with its rib member.
5. An umbrella as claimed in claim 3 or claim 4, wherein the periphery of each  
25 pocket is closed.
6. An umbrella as claimed in any one of the preceding claims, further comprising a secondary sliding means movable along the shaft between said sliding means and the first end of said shaft, and a plurality of secondary struts each pivotally connected between said secondary sliding means and a respective strut.
- 30 7. An umbrella as claimed in claim 6, wherein said secondary struts are about half as long as the struts.
8. An umbrella as claimed in claim 6, wherein said secondary struts are about 15/26 times the length of the struts.

9. An umbrella as claimed in any one of claims 6 to 8, wherein each secondary strut is connected to a strut a pre-determined distance from its connection with said sliding means, wherein said pre-determined distance is substantially equal to the length of said secondary strut.

5 10. An umbrella as claimed in any one of claims 6 to 9, wherein the sliding means includes a spacing means above the position on the sliding means at which the struts are connected and which, during erection of the umbrella, contacts and pushes the secondary sliding means and once the umbrella has reached a fully erected state, fixes the spacing between the sliding means and secondary sliding means.

10 11. An umbrella as claimed in any one of claims 6 to 10, wherein during erection of the umbrella, holding means temporarily hold the secondary sliding means in position at a predetermined location along the shaft before releasing the secondary sliding means once the sliding means has moved a predetermined distance towards the secondary sliding means.

15 12. An umbrella as claimed in any one of the preceding claims, wherein each rib member includes an inner rod means extending between the shaft and a force spreading means and an outer tube slidable on said inner rod means wherein each outer tube is pivotally connected to a strut.

20 13. An umbrella as claimed in claim 12, wherein each force spreading means includes a load spreading surface adapted to transfer radial force from the outer tube of said rib member to the periphery of said canopy via said pocket means.

14. An umbrella as claimed in claim 13, wherein the amount of contact between said canopy and said load spreading surface increases during erection of said umbrella.

25 15. An umbrella as claimed in claim 13 or claim 14, wherein said force spreading means comprises two legs pivotally connected together at a pivot region and forming a substantially 'V' shape when said umbrella is in a collapsed state and wherein said legs are spread apart and substantially aligned during erection of said umbrella, the two legs and the pivot region forming said load spreading surface.

30 16. An umbrella as claimed in claim 15, wherein the outer end of an inner rod means contacts the pivot region of a force spreading means and the outer end of an outer tube is connected to both of the legs of said force spreading means.

17. An umbrella as claimed in claim 15 or claim 16, wherein the outer end of an inner rod means is received within a longitudinal bore provided in a stopper connected to or forming a part of the pivot region of a force spreading means.

18. An umbrella as claimed in any one of claims 15 to 17, wherein each force spreading means includes first and second spreading members, each pivotally connected to a respective pivotally connected leg and non-pivotally connected to a tube mounting hub of said force spreading means, the tube mounting hub connected to the outer end of said outer tube, said inner rod means passing through the tube mounting hub.

19. An umbrella as claimed in any one of claims 15 to 18, wherein said force spreading means is formed from a plastics material and wherein living hinges form the pivotal connections therein.

20. An umbrella as claimed in any one of claims 12 to 19, wherein the inner rod means comprises more than one abutable separate inner rod portions within an outer tube.

21. An umbrella as claimed in claim 20, wherein an inner rod portion furthest from the shaft has a lower weight per unit length than an inner rod portion closer to the shaft.

22. An umbrella as claimed in any one of the preceding claims, wherein no more than six rib members are provided about said shaft.

23. An umbrella frame comprising:

a shaft,

a plurality of rib members, first ends of said rib members spaced about and pivotally connected at or adjacent a first end of said shaft,

a primary sliding means movable along the shaft to erect or collapse the umbrella frame,

a secondary sliding means movable along the shaft between the primary sliding means and the first end of the shaft,

a plurality of primary struts, each of which is pivotally connected between the primary sliding means and a rib member, and

a plurality of secondary struts, each of which is pivotally connected between the secondary sliding means and a primary strut.

24. An umbrella frame as claimed in claim 23, wherein a force spreading means is provided on a second end of each rib member.

25. An umbrella frame as claimed in claim 23 or claim 24, wherein said secondary struts are about half as long as the primary struts.

26. An umbrella frame as claimed in claim 23 or claim 24, wherein said secondary struts are about 15/26 times the length of the primary struts.

5 27. An umbrella frame as claimed in any one of claims 23 to 26, wherein each secondary strut is connected to a primary strut a pre-determined distance from its connection with said primary sliding means, wherein said pre-determined distance is substantially equal to the length of said secondary strut.

10 28. An umbrella frame as claimed in any one of claims 23 to 27, wherein the primary sliding means includes a spacing means above the position on the primary sliding means at which the primary struts are connected and which, during erection of the umbrella frame, contacts and pushes the secondary sliding means and once the umbrella frame has reached a fully erected state, fixes the spacing between the primary sliding means and secondary sliding means.

15 29. An umbrella frame as claimed in any one of claims 23 to 28, wherein during erection of the umbrella frame, holding means temporarily hold the secondary sliding means in position at a predetermined location along the shaft before releasing the secondary sliding means once the primary sliding means has moved a predetermined distance towards the secondary sliding means.

20 30. An umbrella frame as claimed in any one of claims 23 to 29, wherein each rib member includes an inner rod means extending between the shaft and a force spreading means and an outer tube slidable on said inner rod means wherein each outer tube is pivotally connected to a primary strut.

25 31. An umbrella frame as claimed in claim 30, wherein a force spreading means is provided on a second end of each rib member, each force spreading means including a load spreading surface adapted to transfer radial force from the outer tube of said rib member to the periphery of a canopy adapted to be supported by the umbrella frame.

32. An umbrella frame as claimed in claim 31, wherein the effective length or contact area of said load spreading surface increases during erection of said umbrella frame.

30 33. An umbrella frame as claimed in claim 31 or claim 32, wherein said force spreading means comprises two legs pivotally connected together at a pivot region and forming a substantially 'V' shape when said umbrella frame is in a collapsed state and

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wherein said legs are spread apart and substantially aligned during erection of said umbrella frame, the two legs and the pivot region forming said load spreading surface.

34. An umbrella frame as claimed in claim 33, wherein the outer end of an inner rod means contacts the pivot region of a force spreading means and the outer end of an outer tube is connected to both of the legs of said force spreading means.

35. An umbrella frame as claimed in claim 33 or claim 34, wherein the outer end of an inner rod means is received within a longitudinal bore provided in a stopper connected to or forming a part of the pivot region of a force spreading means.

36. An umbrella frame as claimed in any one of claims 33 to 35, wherein each force spreading means includes first and second spreading members, each pivotally connected to a respective pivotally connected leg and non-pivotally connected to a tube mounting hub of said force spreading means, the tube mounting hub connected to the outer end of said outer tube, said inner rod means passing through the tube mounting hub.

37. An umbrella frame as claimed in any one of claims 33 to 36, wherein said force spreading means is formed from a plastics material and wherein living hinges form the pivotal connections therein.

38. An umbrella frame as claimed in any one of claims 30 to 37, wherein the inner rod means comprises more than one abutable separate inner rod portions within an outer tube.

39. An umbrella frame as claimed in claim 38, wherein an inner rod portion furthest from the shaft has a lower weight per unit length than an inner rod portion closer to the shaft.

40. An umbrella frame as claimed in any one of claims 23 to 39, wherein no more than six rib members are provided about said shaft.

41. An umbrella frame comprising:

a shaft,

a plurality of rib members spaced about said shaft, each rib member including a first portion pivotally connected at or adjacent a first end of said shaft and a second portion freely slidable relative to said first portion,

a sliding means movable along the shaft to erect or collapse the umbrella frame, and

a plurality of struts, each of which is pivotally connected between the sliding means and the second portion of said rib member.

42. An umbrella frame as claimed in claim 41, further comprising a secondary sliding means movable along the shaft between said sliding means and the first end of said shaft, and a plurality of secondary struts each pivotally connected between said secondary sliding means and a respective strut.

43. An umbrella frame as claimed in claim 42, wherein said secondary struts are about half as long as the struts.

44. An umbrella frame as claimed in claim 42 or claim 43, wherein said secondary struts are about 15/26 times the length of the struts.

45. An umbrella frame as claimed in claim 43 or claim 44, wherein each secondary strut is connected to a strut a pre-determined distance from its connection with said sliding means, wherein said pre-determined distance is substantially equal to the length of said secondary strut.

46. An umbrella frame as claimed in any one of claims 42 to 45, wherein the sliding means includes a spacing means above the position on the sliding means at which the struts are connected and which, during erection of the umbrella frame, contacts and pushes the secondary sliding means and once the umbrella frame has reached a fully erected state, fixes the spacing between the sliding means and secondary sliding means.

47. An umbrella frame as claimed in any one of claims 42 to 46, wherein during erection of the umbrella frame, holding means temporarily hold the secondary sliding means in position at a predetermined location along the shaft before releasing the secondary sliding means once the sliding means has moved a predetermined distance towards the secondary sliding means.

48. An umbrella frame as claimed in any one of claims 41 to 47, wherein a force spreading means is provided on the end of each rib member furthest from the shaft.

49. An umbrella frame as claimed in claim 48, wherein the first portion of each rib member includes an inner rod means extending between the shaft and a force spreading means and an outer tube slidable on said inner rod means wherein each outer tube is pivotally connected to a strut.

50. An umbrella frame as claimed in claim 48 or claim 49, wherein each force spreading means includes a load spreading surface adapted to transfer radial force from

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the outer tube of said rib member to the periphery of a canopy adapted to be supported by the umbrella frame.

51. An umbrella frame as claimed in claim 50, wherein the effective length or contact area of said load spreading surface increases during erection of said umbrella frame.

52. An umbrella frame as claimed in claim 51, wherein said force spreading means comprises two legs pivotally connected together at a pivot region and forming a substantially 'V' shape when said umbrella frame is in a collapsed state and wherein said legs are spread apart and substantially aligned during erection of said umbrella frame, the two legs and the pivot region forming said load spreading surface.

53. An umbrella frame as claimed in claim 52, wherein the outer end of an inner rod means contacts the pivot region of a force spreading means and the outer end of an outer tube is connected to both of the legs of said force spreading means.

54. An umbrella frame as claimed in claim 52 or claim 53, wherein the outer end of an inner rod means is received within a longitudinal bore provided in a stopper connected to or forming a part of the pivot region of a force spreading means.

55. An umbrella frame as claimed in any one of claims 52 to 54, wherein each force spreading means includes first and second spreading members, each pivotally connected to a respective pivotally connected leg and non-pivotally connected to a tube mounting hub of said force spreading means, the tube mounting hub connected to the outer end of said outer tube, said inner rod means passing through the tube mounting hub.

56. An umbrella frame as claimed in any one of claims 52 to 55, wherein said force spreading means is formed from a plastics material and wherein living hinges form the pivotal connections therein.

57. An umbrella frame as claimed in any one of claims 49 to 56, wherein the inner rod means comprises more than one abutable separate inner rod portions within an outer tube.

58. An umbrella frame as claimed in claim 57, wherein an inner rod portion furthest from the shaft has a lower weight per unit length than an inner rod portion closer to the shaft.

59. An umbrella frame as claimed in any one of claims 41 to 58, wherein no more than six rib members are provided about said shaft.

60. An umbrella including a canopy supported by an umbrella frame as claimed in any one of claims 23 to 59.

61. An umbrella as claimed in claim 60, wherein the canopy includes pocket means at or adjacent to the periphery of the canopy wherein an opening or openings in the pocket means is accessible from the direction of the central portion of the canopy.

62. An umbrella as claimed in claim 61, wherein the inside of the or each pocket means, at least opposite to the opening, is closed to provide a bearing surface upon which the force spreading means contacts.

63. An umbrella as claimed in claim 61 or claim 62, wherein a force spreading means is provided on the end of each rib member furthest from the shaft, wherein said pocket means comprise a plurality of separate pockets spaced about the canopy's periphery, and wherein one force spreading means is received within each pocket.

64. An umbrella as claimed in claim 63, wherein a closed edge of each pocket lies along the periphery of the canopy and the opening in each pocket is in the form of a slit substantially aligned with its rib member.

65. An umbrella substantially as herein described with reference to and as illustrated by the accompanying drawings.

66. An umbrella frame substantially as herein described with reference to and as illustrated by the accompanying drawings.